

Novel Wick Structures for Improved Heat Pipe Performance, Phase I

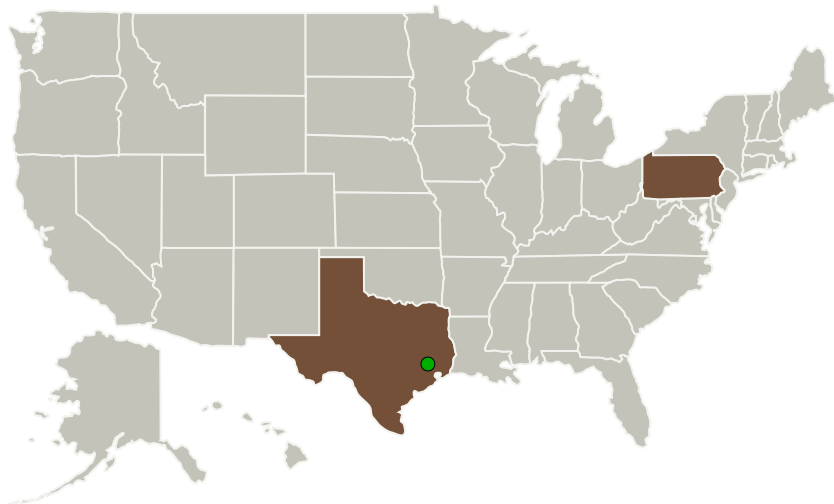


Completed Technology Project (2011 - 2011)

Project Introduction

Heat pipes are commonly used for transporting heat over relatively long distances with very low temperature drop. One of the limitations of heat pipes is the capillary limit, which states that the sum of pressure drops of the working fluid cannot exceed the capillary head developed by the wick. Since most of the working fluid pressure drop is incurred in flow through the wick, it is important to reduce the wick resistance as much as possible while still being able to transport the required thermal load. All heat pipes made today have the same wick throughout the heat pipe. This facilitates manufacture, however it causes a great deal more resistance to liquid flow than is minimally required. By breaking the wick up into several different regions in which the wick properties are different, a more optimal stepwise wick is proposed. Preliminary calculations done by the PI indicate that the capillary limit of a heat pipe can be increased by a factor of 2x to 3.5x, depending on the number of discrete steps the wick is divided into. The proposed program aims to demonstrate the improvement in capillary limit experimentally.

Primary U.S. Work Locations and Key Partners



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| Organizations Performing Work | Role | Type | Location |
|-------------------------------|-------------------------|-------------|-------------------------|
| Thermacore, Inc. | Lead Organization | Industry | Lancaster, Pennsylvania |
| ● Johnson Space Center(JSC) | Supporting Organization | NASA Center | Houston, Texas |

Primary U.S. Work Locations

| | |
|--------------|-------|
| Pennsylvania | Texas |
|--------------|-------|

Project Transitions

▶ **February 2011:** Project Start

✓ **September 2011:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138382>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Thermacore, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Mark T North

Co-Investigator:

Mark J North

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Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.2 Thermal Control Components and Systems
 - └ TX14.2.2 Heat Transport

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System